**Montana Hospital Discharge Data System**

Surveillance Report

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## Hospitalizations In Montana Due To Injuries Caused By Animals, 2000-2009

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Animals pose an underappreciated potential health threat to Montana residents and visitors. Both wild animals, such as snakes and spiders, and domesticated animals, such as improperly restrained dogs, are capable of injuring humans.[1] Exposure to animals increases in the summer months, as people spend more time outdoors. Some exposures result in hospitalizations. This report describes those hospitalizations in Montana from 2000-2009.

The Montana Hospital Discharge Data System (MHDDS) examined all inpatient hospitalizations at Montana hospitals due to animal injuries, regardless of residence of the patients, from 2000 to 2009.[2] To account for the different environments found east and west of the Continental Divide, region was used as a variable in the analysis. Geographic analysis was based on the location of the hospitals where treatment was provided; location of the treating hospital is likely to correspond more closely than patient residence to the place where the injury occurred, although we cannot discount the possibility that patients may have travelled long distances to seek treatment. Data on geographic location of injury are not available in MHDDS.

Hospitalizations due to injuries caused by animals were identified by External Cause of Injury codes (E-codes) E905 (Venomous animals and plants as the cause of poisoning and toxic reactions) and E906 (Other injury caused by animals) in either diagnosis fields or E-code fields.[3] For venomous animals, major categories were subcategorized as bites from snakes or spiders and stings from hornets, wasps, and bees. Dog bites were analyzed separately from other injuries caused by non-venomous animals, which may include injuries other than bites.

The MHDDS cannot be meaningfully analyzed for temporal trends or peak years of occurrences in animal-related injuries because the completeness of E-coding in the MHDDS increased during the years of this assessment. From 2000-2007, only 28% of injury hospitalizations had E-codes; while in 2009 90% had E-codes. Healthy adults are less likely to be admitted for these injuries than are the very young, the elderly, or those with comorbidities; the MHDDS does not have Emergency Department or outpatient data over the period from 2000-2009, so the number of hospitalizations is an undercount of all encounters. The MHDDS does not have

[1] http://fwp.mt.gov/recreation/safety/wildlife/snakes/; http://www.animallaw.info/statutes/stusmtst7_23_101.htm

[2] The Montana Hospital Discharge Data System (MHDDS) receives annual de-identified hospital discharge data set through a Memorandum of Agreement with the Montana Hospital Association. Most hospitals in Montana participate in voluntary reporting of discharge data from their Uniform Billing Forms, version 2004 (UB-04). The MHDDS receives information on more than 95% of the inpatient admissions in the state.

[3] http://www.icd9data.com/

individual identifiers to allow tracking a patient admitted more than once for a single event. Information on charges was added to the MHDDS in 2008. Total charges are presented on a crude basis; no attempt to control for inflation or increases in health care costs was made.

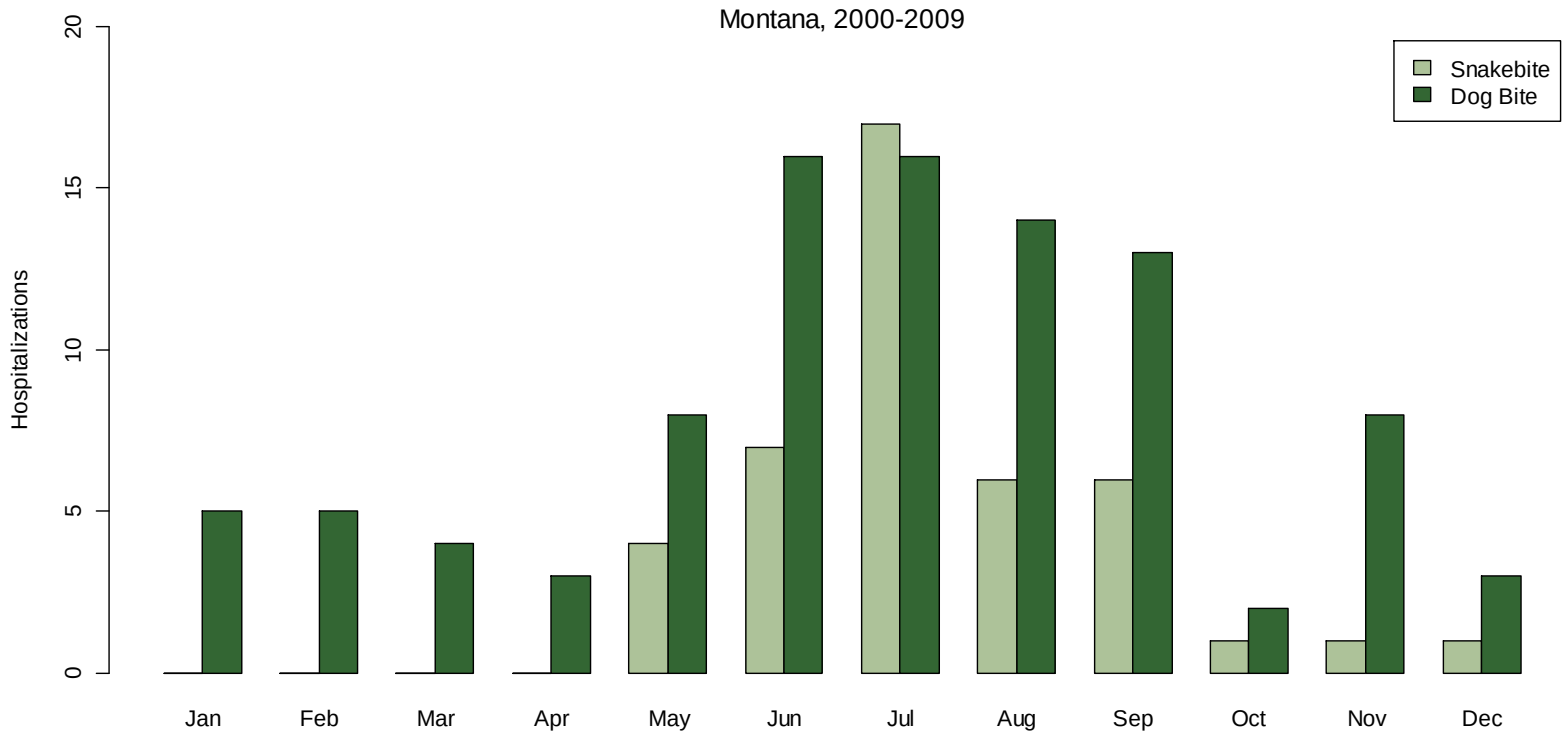
There are a limited number of venomous species that pose risk to humans in Montana; E-codes only record broad categories of animals that cause injury. Montana has a single species of poisonous snake, the prairie rattlesnake.[4] Rattlesnake bites are responsible for 95% of snake related fatalities in the United States.[5] Because rattlesnake bites are more severe than bites from other species of North American snake, such as the copperhead, rattlesnake bites usually require treatment with antivenom.[5,6] The black widow spider is native to Montana and the hobo spider was introduced in the 1930s.[7] There are many species of bees and wasps in Montana, including the very common western yellowjacket.[8] For injuries associated with non-venomous species, the E-codes do not contain sufficient information to determine whether injuries are due to domestic or wild animals, with the exception of those specified as dog bites. Attacks attributed to unspecified animals may be due to unconfirmed dog attack or encounters with livestock or wildlife.

There were 97 hospitalizations attributed to bites and stings from venomous animals, with the most common being snakes (n = 43); hornets, wasps and bees (n = 25); and spiders (n = 22). The remaining five venomous bites were due to unspecified species. There were 562 hospitalizations due to encounters with non-venomous animals, of which 97 were specifically identified as dog bites.

Patients hospitalized due to encounters with non-venomous animals were almost equally distributed between males and females (53% male); males accounted for 72% of hospitalizations due to snake bite. Eastern Montana has only about 45% of the state's population but 81% of hospitalizations for snake bites occurred in eastern Montana. This is consistent with the likelihood of exposure to the prairie rattlesnake, which is found throughout most of Montana but is more common in the Ponderosa pine stands and mixed grass-coniferous forest in the eastern plains.[4] The great majority of snakebites (93%) happened during warm months, reflecting both the period of greatest activity of snakes and recreational activities that bring people into proximity with them (Figure 1); rattlesnakes hibernate and do not emerge until April or May.[9] Admissions occurring in winter months may have been due to sequelae from snakebite or due to bites by captive snakes. More than 20% of snake bites were to non-residents, suggesting that non-residents may visit Montana for outdoor recreation and may be less familiar with precautions to prevent snakebite. In contrast to the strong clustering of snake bites in the warm months, dog bites occurred in the winter as well.

[4] http://fieldguide.mt.gov/detail_ARADE02120.aspx
[5] Juckett, G, Hancox J. 2002 *Am Fam Physician*.65(7):1367-1375
[6] White RR, Weber RA. 1991. *Ann Surg.* 213(5):466-71; discussion 471-2.
[7] http://msuextension.org/publications/AgandNaturalResources/MT199210AG.pdf
[8] http://ipm.montana.edu/YardGarden/docs/waspsyellowjackets-insect.htm
[9] http://www.nps.gov/bica/naturescience/prairie-rattlesnake.htm

Figure 1. Month Of Hospitalization For Snakebite Or Dog Bite




Previous reports found that adult men are most likely to be bitten by rattlesnakes.[10] However, in our data, children under the age of 10 years were hospitalized more often than adults (Figure 2). Young children may be hospitalized more frequently because they are more vulnerable to snake bites, given that the lethal dose of venom is dependent on body size. Adults may be better able to withstand snake venom with only supportive outpatient care. Children under the age of 10 years were also hospitalized most often for dog bites (Figure 3). Young children may be hospitalized more frequently for dog bites for similar reasons of physical vulnerability, or because they are more likely than adults to be attacked or severely injured by dogs.

[10] http://www.imba.com/resources/nmbp/treating-snake-bites; Morgan, DL, et al. 2007, *South Med J.* 100(2):152-6.

Figure 2. Age Of Patients Hospitalized For Snakebite

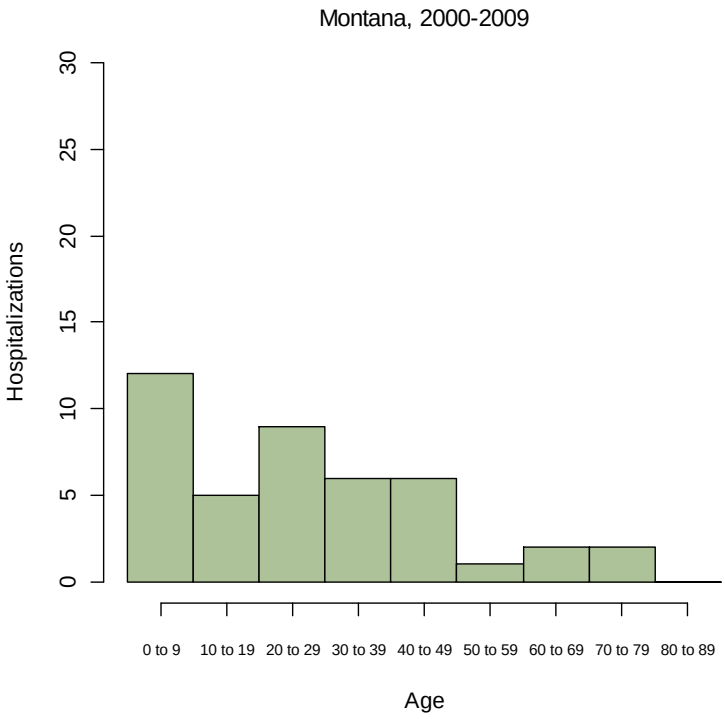
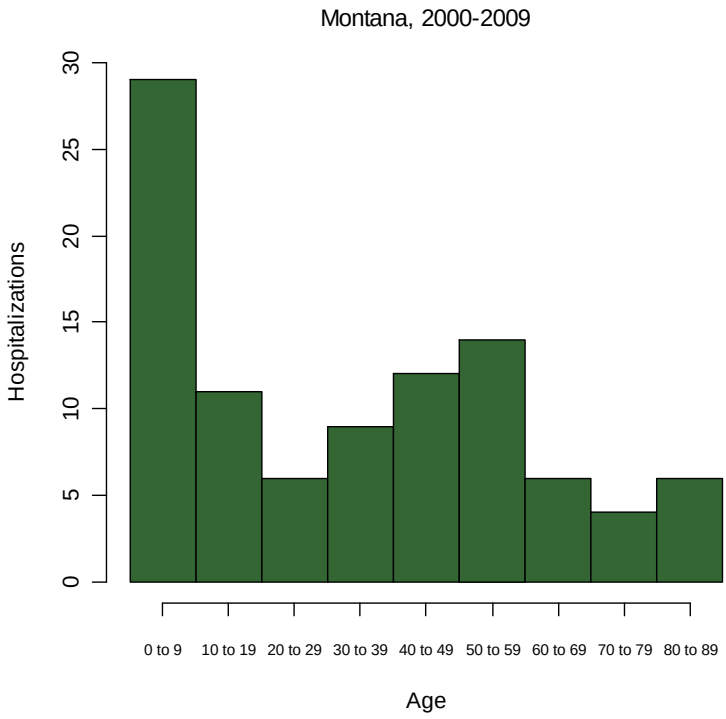



Figure 3. Age Of Patients Hospitalized For Dog Bite




Total charges for hospitalizations due to animal injuries were $4.4 million; 22% of the charges were due to venomous bites and 78% were due to dog bites and other encounters with animals. Total charges were highest for injuries caused by unspecified encounters with non-venomous animals, apart from dog bites, mainly due to the large number of hospitalizations (Figure 4). The average length of stay for injuries caused by all venomous animals was 2.7 days and for snake bites it was 2.5 days. The average length of stay for injuries due to encounters with non-venomous animals, apart from dog bites, was 3.3 days and for dog bites it was 2.5 days. However, snake bites had very high average charges, despite having a modest length of stay (Figure 5). One reason for this may be the high cost of antivenom, which can cost up to $2,000 per vial; patients may require multiple vials, depending on the size of the snake and bite location.[11]

[11] http://www.nctimes.com/news/local/san-marcos/article_9cd4792e-00fe-5f05-b782-7ed881ff71d2.html

Figure 4. Total Charges Per Year, Montana, 2008-2009

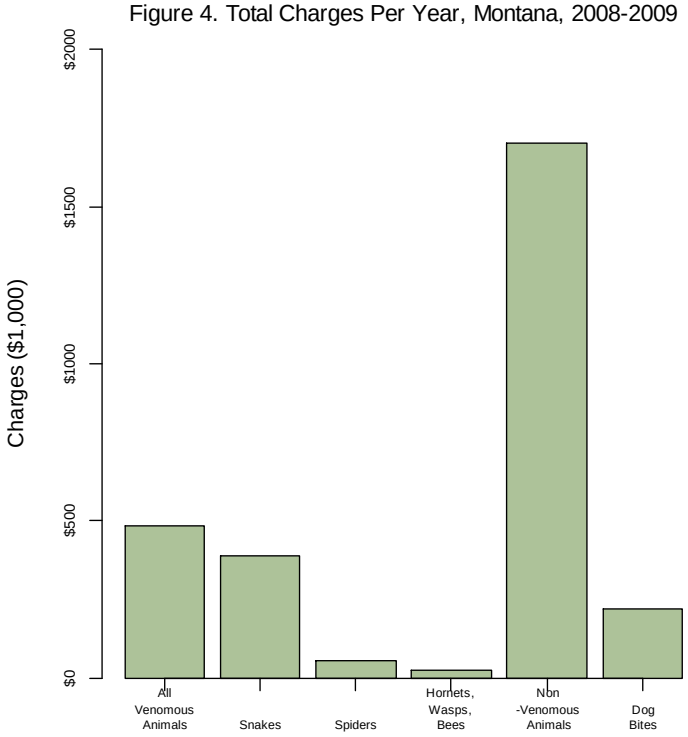
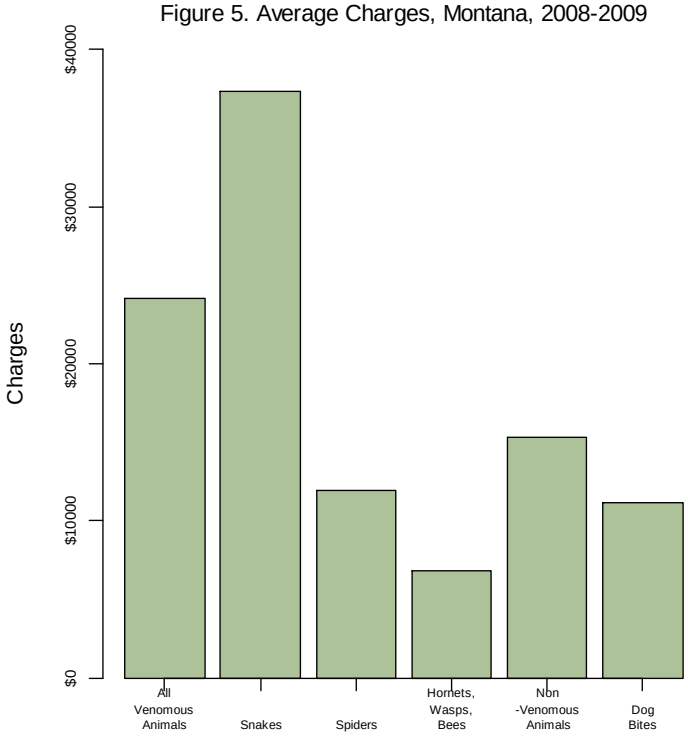



Figure 5. Average Charges, Montana, 2008-2009




Thirty-nine percent of US households have at least one dog.[12] Despite the large number of human-dog interactions, hospitalizations from dog bites remain relatively uncommon. On the other hand, although there were fewer hospitalizations for snake bites, the limited opportunity for human-snake interactions suggests that snakes may pose an unappreciated threat. Likewise, although the very young or very old are less likely to be bitten, their greater vulnerability means that they too must be vigilant in snake territory. Children are especially vulnerable and should be taught caution and supervised.

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Alternative formats of this document will be provided on request. Please contact
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[12] http://www.humanesociety.org/issues/pet_overpopulation/facts/pet_ownership_statistics.html